Technical and Bibliographic Notes/Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- [x] Coloured covers/ Couverture de couleur
- [ ] Covers damaged/ Couverture endommagée
- [ ] Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- [ ] Cover title missing/ Le titre de couverture manque
- [ ] Coloured maps/ Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- [x] Bound with other material/ Relié avec d'autres documents
- [ ] Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distortion le long de la marge intérieure
- [ ] Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- [ ] Additional comments:/ Commentaires supplémentaires:
- [ ] Coloured pages/ Pages de couleur
- [ ] Pages damaged/ Pages endommagées
- [ ] Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- [ ] Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- [ ] Pages detached/ Pages détachées
- [x] Showthrough/ Transparence
- [ ] Quality of print varies/ Qualité inégale de l'impression
- [ ] Includes supplementary material/ Comprend du matériel supplémentaire
- [ ] Only edition available/ Seule édition disponible
- [ ] Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image/ Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
							✓				

The copy filmed here has been reproduced thanks to the generosity of:

Metropolitan Toronto Library
Science & Technology Department

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche shall contain the symbol —► (meaning "CONTINUED"), or the symbol ▼ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:

L'exemplaire filmé fut reproduit grâce à la générosité de:

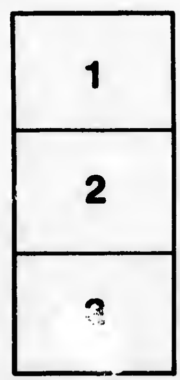
Metropolitan Toronto Library
Science & Technology Department

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole —► signifie "A SUIVRE", le symbole ▼ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.



PUBLICATIONS

FROM THE

BIOLOGICAL LABORATORY

OF THE

UNIVERSITY OF TORONTO.

No. II.– PEACH YELLOWS.

By W. R. SHAW, M.D.

(Reprinted from the Transactions of the Canadian Institute, Vol. II., Pt. 2.)

TORONTO:
THE COPP, CLARK COMPANY, LIMITED, PRINTERS.

1892.

ap
th
tr

fo
a

ou
th

“
to

(r
w
lo
d
o
th

fu
b
fo
I
c

it
I

[*Extract from Transactions of the Canadian Institute, 1890-91.*]

PEACH YELLOWS.

By W. R. Shaw, M.D.

[*From the Biological Laboratory of the University of Toronto.*]

(*Read 21st November, 1891.*)

Yellows is an infectious disease which occurs in almonds, nectarines, apricots and peaches, in which it is characterized by particular lesions in the fruit, foliage, development, and general appearance of the affected tree.

The duration of the disease is long, generally lasting over a period of four years, and the name is derived from the yellowish appearance which a tree in foliage assumes when so affected.

The work having been done wholly in connection with peach trees, our remarks are accordingly confined to the nature of the disease in that particular class.

It would be as well to style this subject not "peach yellows," but "yellows in peaches," as you will see by the above that it is not peculiar to that one particular fruit.

These investigations were begun in the early part of the past summer (1891) to find out if a cause could be discovered for the disease, and this work has been pursued in the ordinary methods adopted for a bacteriological investigation. It is of importance, both scientifically and from a domestic point of view, and if by any means some light can be thrown on the disease so that proper steps may be taken to stop its ravages, then to my mind an important work has been done.

It is to be regretted that the subject has not had more time for its further consideration, but it being desirous to bring it as soon as possible before the Canadian Institute in order that they may use their influence for the proper means being adopted for the stamping out of the trouble, I must present this as the apology for the present paper being incomplete and simply a "preliminary report of the work."

Before proceeding, a short résumé of the history of this disease since its first authentic description on this continent, would not be amiss, and I am much indebted to the report of Mr. E. F. Smith, of the Department of Agriculture at Washington, who has written an exhaustive history on this subject.

The disease first made its appearance in Pennsylvania in 1791 or nearly about that period, whence it has spread in all directions. The next place it was noticed was in New Jersey, in 1806, and a second epidemic affected the orchards of that State in 1846, doing most extensive damage to the trees. It is remarked in New York State in 1814, and in 1833 "yellows" is given out as one of the chief causes of the decay of the peach cultivation in that State.

Following north, Connecticut was visited in 1814-15, and one cultivator in that State fully recognizes the infectious nature of the disease, for in 1845 he writes: "When one tree is infected other trees standing near would be unless the infected tree was immediately removed, in which case the healthy trees would generally be preserved."

Massachusetts seems to have escaped until much later, and in 1882 it was said that yellows was not in existence in that State.

Again starting from Pennsylvania, its spread in a north-west direction has been carefully traced. It appeared in Ohio in 1849, and in July of 1878 it is described as being in the Niagara County of N. Y. State. It is but a short distance from there to our own Niagara peninsula, and in Ontario in 1878 a Mr. A. M. Smith, of Drummondville, writes an article in the *Canadian Horticulturist* under the title of "A Word of Warning to Peach-Growers in Ontario," in which he remarks that "Perhaps it is not generally known, but it is, nevertheless, a fact, that the disease so destructive to peach orchards, called the yellows, has made its appearance in our midst. Quite a number of orchards on the frontier, particularly in the neighborhood of Drummondville and Stamford, have had affected trees in them the last season, and some in the great peach-growing section of Grimsby." In the autumn of the same year Mr. Smith's report was confirmed by Mr. L. Wolverton, and he draws up a resolution to the effect that "when anyone noticed the first indications of the disease, the trees so affected should at once be removed from the orchard and destroyed."

By the year 1880 the disease had become prevalent throughout the whole of the Niagara district, and thus we have it fairly established in our midst.

In 1881 the Legislative Assembly passed an Act to prevent its further spread, which was amended in 1884 and the American work to which I referred in the beginning of this paper, comments on it as follows:—

"That it is practically worthless for the following reasons:

1st. A petition of 50 ratepayers is necessary to secure the appointment of an inspector, if council is not disposed to appoint one without.

2nd. The inspector can act only on a written complaint.

3rd. The fine is trifling both for neglect to destroy trees and for selling fruit.

4th. No provision is made for the immediate and complete destruction of trees and fruit in case of neglect or refusal on part of the owner to comply with the law."

And now to continue the history of the spread and destruction by yellows. It spread throughout Michigan, and that State from being the foremost one in the world for peach culture has fallen of late years to a much lower place, and to cite figures—the number of acres in peach orchards in 1874 was 6000, making about 654,000 trees, while in 1884 the numbers had fallen respectively to only 503 and 54,827.

The same tale is reproduced in each State where the orchards have become infected with the disease—a few States are said to be exempt, but some uncertainty prevails as to the truth of the assertion.

Let us now pass on to the *symptoms*, better styled *signs*.

Fruit.—One of the first signs noticed in the early part of the century and before the disease had been definitely described and located, was the fact that some fruit ripened prematurely, and it was soon found that this was one of the first or almost premonitory signs of the affection. This early ripening is irregular in length of time, varying from a few days to even six weeks, but the average is generally a ripening two or three weeks in advance of the proper time. Along with this sign may be mentioned the characteristic changes in the coloring of the fruit. As a rule there is more color than usual, but along with that is the "coarsely blotched" appearance with red or purple spots, these spots being irregular in size and striking in appearance, giving to the fruit a mottled or speckled look. They are, as a rule, well marked, being much darker than the background. Sometimes they coalesce, and the fruit then presents the appearance of a dark red or crimson color. [I might note here that the sure diagnosis should not be made until the fruit is opened, as we found in one variety in an orchard the small dots on the surface but not at all in the substance of the peach.] In peaches which are diseased these spots are not confined to the covering, but on cutting into the fruit at right angles to the surface, red streaks are seen which can sometimes be traced from the pit to the surface and corresponding with the "surface marking" above described: a cross section of the fruit shows these lines as red dots in the yellow substance of the peach, which is pathognomonic. The reddish or crimson color around the pit is also increased above that of normal healthy fruit.

Taste.—The taste is sometimes normal, sometimes the fruit is quite insipid, not infrequently slightly bitter. In some of the samples tasted this year the flavor seemed to strike the back of the palate after a few seconds and had a "tannic character" to it, lasting quite a time after the peach had been tasted.

Decay.—This occurs more rapidly than in normal fruit.

As a rule the above are the signs which are first discoverable in a tree which is affected. The following season not only will the peach but also the foliage and smaller branches show signs of the disease.

Shoots.—The young shoots develop and sometimes fill the whole interior of the tree top. This growth consists of small, unhealthy shoots which are frequently much branched; the leaves are small, narrow and sharp, and are clustered a good deal and the whole combination gives the tree quite a bunchy appearance at the top. According to some of our Canadian growers, these characteristic branches are seen first on the large primary branches of the tree and are found growing up as thin delicate shoots with the same small leaves, and all with a yellowish tinge about them. It should have been remarked above that the leaves are yellowish in color, and hence along with the bunchy appearance is also the yellowish colour of the tree from which the name of the disease is derived. The leaves are very justly compared to those of a willow tree, and average not more than two or three inches long by one-quarter or one-third inch wide. The shoots are much like willow twigs in form, but are not so resilient.

These small, ill-developed twigs, along with the not too markedly yellowish tinge of the tree, and its bushy appearance, quite diagnose the affection in the tree itself.

Frequently only one limb is affected that year, but next season the disease will be noticed to be general throughout the whole tree.

The following year the tree has all the above signs in a more marked degree, frequently having no fruit on it, and with death of some of the limbs. The foliage is dwarfed, yellowish or reddish-brown, and more or less curled or in-rolled, over the whole of the tree, and the tree at once presents a striking appearance when compared to the deep green of a healthy one. The curling of the leaves is generally due to insects, and often there are brown or red spots on the foliage, which are caused by the fungus Cersospera, which finds a more favorable nidus for growth on diseased leaves.

The diseased trees seldom live longer than four years, and at that period of the affection they have scant foliage, are very brittle and stiff, and altogether present a strikingly unhealthy appearance. They rarely produce fruit in the late stages, and have many dead limbs.

Symptoms in man from eating the fruit.—We will now pass on to the symptoms frequently produced in man and will then take up the diagnosis.

Violent diarrhœa, slight fever, much abdominal pain and discomfort of three or four days' duration form the symptoms which mark the eating of the fruit. One physician informed us of a whole family having been so affected through eating diseased peaches, and he attributed many other attacks of a similar nature to a like source, although the evidence was not so direct.

Diagnosis.—The disease must be discriminated from several other conditions which produce somewhat similar changes in the appearance of the trees, but the fruit is diagnostic, in that the changes only appear in this one affection.

The borer.—The larvæ of the "Aegina Exitiosa." A careful examination of the tree will reveal the cause of the unhealthy appearance. Then in this as above stated the fruit is not affected, and again the leaves are said to fall off in August when the tree is vigorously shaken, which is not so with those affected with yellows.

Root Aphis.—This attacks the roots of the peach tree, and consequently the nourishment is much impaired. It is mostly found in trees planted in sandy ground. The trees are generally stunted in their third or fourth year. Again the same remark applies to the peculiar alteration of the fruit, which will never be seen when the tree is destroyed by the Aphis.

Peach Nematode—Does not occur in this country, and hence can be passed over.

Starvation.—Trees planted in pure sand and peat produce a feeble growth. Cultivation will alter this condition and also its method of attacking groups and not isolated trees will help in the diagnosis.

Wet subsoil—May also produce unhealthy trees, but in this as in all the above conditions the fruit will diagnose the condition.

Cause.—This portion of the work will perhaps be the most interesting, for we are aware that until the cause of a disease is discovered, and the affection placed in its proper category, proper methods of dealing with the disease cannot be instituted. It has been my object since beginning these investigations to find, if possible, a probable cause of yellows in the form of a micro-organism and to isolate it from the diseased trees. Guided by the work of Prof. Burrill, of Champaign, Ill., who has isolated a bacillus from the affected trees, I proceeded in the same lines adopted by him.

To be sure there will be many who still maintain that soil exhaustion, etc., etc, will produce the disease, but from observations of others and the few which I have made myself, I have come to the conclusion that it is a disease which is due to a bacillus and undoubtedly contagious or infectious in character. Soil exhaustion may play a part, in that it will leave a tree more liable to infection than a perfectly healthy one, but aside from that I am of the opinion that it constitutes no part whatever in the disease.

There seems much variance of opinion as to whether a tree planted in the place of the one which has been removed will contract the disease, and it cannot be stated with any definiteness which is the correct opinion. More careful inquiry will have to be made before it can be answered.

Then again, considering that the affected tree does not generally infect those in its vicinity, but ones quite removed from it, spreading in this irregular manner throughout the whole orchard, and in combination with this the fact of the disease first showing itself in the fruit, it appears to me a likely hypothesis that the flower of a diseased tree contains the germ in an active state, and that it is conveyed thence to other trees by bees or the wind, thus also explaining how it spreads in the above described erratic manner. This to me seems the most feasible proposition for the spread of the disease, but of this we shall hope to be able to speak with more certainty at some future time.

I shall now proceed to detail the results of the work. During the past summer a few trips were made to Niagara-on-the-Lake, and with ordinary bacteriological precautions, inoculations were made into tubes of agar-agar from the cambium layer of the bark. Many of these tubes developed nothing, but in others some results were obtained, and so far I have found three distinctive forms present in the diseased trees, which forms are bacilli, and will be respectively styled A. B. and C.

Bacillus A — Found in 21 per cent. (about) of the affected trees: Under the microscope—small bacillus, even staining, frequently in pairs, rounded ends, and very often curved. Size, 5 to $6\mu \times 9\mu$. Stains well with Mythyl. Blue (Alk.), Fuchsin (carbolic), and by Gram's method.

Hanging Drop.—Very active.

Culture.—Appeared on surface of agar-agar two days after inoculation as a small, white, thin, moist colony.

Agar-agar plate.—Small white col. which under low power is yellowish white, irregularly round colony with irregular wavy edge and dark central spot, flat and finely granular; slightly dome shaped thinning away at the edge to transparency.

Agar-agar stab.—White healthy growth spreading well on the surface of agar-agar as smooth, white, glistening colony, not moist. It grows well along the needle track, not tapering at all, but same thickness throughout.

Gelatine plate.—Small, round, white col. which is about ½ m.m. in diameter at the end of five days. Under low power of microscope the surface colonies look like perfectly round, smooth, yellowish white colonies, flat surface, semi-transparent, edges thin and very smooth. (The very thin colonies show fine granulations.) Some colonies seem to be made up of rings of different depths of color; no liquefaction at end of three days but commencing on the fifth and proceeding rapidly.

Gelatine stab.—Grows rapidly and well in gelatine. No liquefaction at end of six days. Appears as yellowish white, smooth, moist looking colony, spreading on the surface with an irregular outline; grows slightly along the track of the needle as a very finely granular growth, tapering from the surface and not spreading in the gelatine. After 15 days liquefaction commencing and proceeding in a champagne-glass form. The surface is covered with the tenacious, slimy colony and the liquefied gelatine is cloudy with fine granules with a precipitate of the same nature. Rest of the medium clear. After about 20 days the liquefaction has extended over the whole surface of gelatine, and it is gradually all becoming liquefied with the above characters continued.

Bouillon.—Produces fine white growth on surface which sinks on a gentle shaking of the tube. The whole of the medium becomes misty in appearance, due to fine white granules suspended throughout the Bouillon.

Potato.—Yellowish white, elevated, convex growth with smooth, dry surface, extending very slightly beyond the line of inoculation. Surface is irregularly marked with slight depressions which cross it at right angles to the long diameter of the growth. In many places the growth looks like drops of yellowish wax on the potato. The color of the potato does not seem to be altered by the growth.

Temperature.—Grows at the temperature of the room, and it seems to be very susceptible to heat, the warmth necessary for keeping the agar-agar tubes fluid seemingly destroying it.

Spore formation.—

Color.—Not any, except slight tinge of yellow in the potato growth.

Action on gelatine.—Grows fairly rapidly and is a slow liquefier throughout—10 cc. of gelatine not being all liquefied in 33 days.

Bacillus B occurred only in 7 per cent. of the tubes. Under the microscope it appears as a very large bacillus, rounded ends and showing tendency to go in pairs and chains of three or four. Very marked spore formation. Size, $1{\cdot}8\mu \times 9{\cdot}0\mu$. Stains well with all the stains and with Gram's, Carbolic Fuchsin, etc.

Hanging drop.—Motionless.

Culture.—Appeared in the original tube as white growth spreading much on surface and not elevated.

Agar-agar plate.—Oval, yellowish white, large colony. Under low power—oval, blackish, thick colony, very granular, dome shaped, edges very rough and the colony irregular in outline.

Agar-agar stab.—Rapid growth, spreads much on the surface as slightly elevated, smooth, glistening, white colony with somewhat irregular outline. Grows well in the substance of the agar-agar along the track of the needle, but tapering away from the surface. After three weeks the growth becomes yellowish tinted.

Gelatine plate.—After three days, the deep colonies appear as small, round, white dots and those on the surface as irregularly round, white, and spreading to about 1 m.m. in diameter. Under low power the surface colonies appear as very irregularly round, yellowish brown, mottled, flat, opaque colonies, slightly thicker in the centre, with very irregularly indented outline, the projections not being sharp but all rounded at points, and it is seen that this is due to the fact that the colony is made up of a mass of fine intertwining threads and these do not project singly but curve around and give the consequent appearance to the projections. The colony is very suggestive of the "caput medusæ." The deep colonies are small round, opaque, flat growths with fine barblike projections from the edge. After five days liquefaction first beginning, being shown by a depressed zone of clear gelatine.

Gelatine stab.—An exceedingly slow liquefying growth, and only liquefies around the needle puncture, at the entrance to gelatine, after 15 days. Grows very slowly in the gelatine along the needle track as a yellowish white, finely granular, tapering growth, not spreading in the substance of the gelatine. It spreads on the surface slightly and appears as a yellowish white, smooth, slightly elevated, moist looking colony with irregular outline. The liquefaction proceeds very slowly and in the same manner as Bacillus A (*i.e.*, in champagne-glass form), the surface of the fluidified gelatine being covered by the original surface growth and the liquefied gelatine opaque from finely suspended white granules There is a yellowish while granular precipitate at the bottom of the liquefied gelatine. Rest of the medium is quite clear and solid. After a time the surface colony subsides, and the liquefaction has extended to margins of the gelatine.

Bouillon—Does not make it cloudy, but grows up the side of the tube from the bottom, appearing as very finely granular. No growth on the surface, but slight precipitate.

Potato.—Rapid growth, yellowish, abundant, spreading over the surface of the potato, slightly elevated, edges smooth, but irregular contour, surface moist, glistening and smooth. After two weeks the growth becomes markedly yellow and is thrown into numerous folds.

Temperature.—Grows at ordinary room temperature ; not susceptible to heat as Bacillus A.

Spore formation.—Very marked ; sometimes three or four large, oval spores seen lying irregularly within a bacillus.

Color.—Yellowish tinge to growth on both agar-agar and gelatine, and a marked yellow growth on potato.

Action on gelatine.—Grows slowly in gelatine, and is a slow liquefier.

Bacillus C occurs also in 7 per cent. of the tubes. Under the microscope it appears as a long, thick bacillus with square ends and corners rounded off. Spores noticed—occurs much in pairs and long chains. Size, ·9 to 1·0 $\mu \times$ 2·7 to 3·6 μ.

Hanging drop.—Slight movement.

Culture.—In original tube appeared as a thin, white growth, spread over the lower portion of the agar-agar.

Agar-agar plate.—White, oval, fairly large colony. Under low power dirty whitish yellow, granular, thick, irregularly oval colony with indented edges. Dome shaped.

Agar-agar stab.—Very slow growth along the track of the needle when it appears as a well marked, white, rough-edged growth, same thickness along whole length of puncture. Does not grow on the surface until after a week, when it appears as very irregular, slightly elevated, thin, whitish, smooth surfaced growth, and not spreading but very little on the surface of the agar-agar.

Gelatine plate.—Colonies develop slowly and appear after five or six days. Those in the depth are small, round and white. Superficial ones are thin, white and more spreading. After six days a small depression of commencing liquefaction seen which then continues quite rapidly. Under low power the superficial ones appear as flat, slightly darker in centre, yellowish colonies with very irregular outline, and the whole growth seen to consist of fine threads, twisted in all directions and projecting into the gelatine and giving the colony a hairy appearance. The deep colonies are dark brownish yellow with opaque centre being slightly thinner at margin. Some small projecting fibrillae, which do not seem to extend into liquefying zone.

Gelatine stab.—Very slow growth and still slower liquefaction. At first grows only in the depth of the tube, and not on the surface at all. It appears as a finely granular white growth, from which fine filaments extend into the gelatine a short distance from the needle track. These filaments continue to spread and increase in size, and become larger at the outermost ends. They also increase in length as they approach the surface, and give one the idea of a small balsam tree inverted. The central part which was the original needle track has also increased in size and is seen to be composed of fine granules which seem to be suspended throughout that portion of the gelatine forming the main stem of the tree, as it were, and also tapering in the depth. After one month's growth the gelatine was seen to be dipping as if drawn in towards the stem portion of the growth. To look down on the growth at this stage it has the appearance of a central, round, finely granular zone, which is well defined, and spreading out from it making a complete circle of rays, are the filaments above described. This dipping gradually progresses until the growth apparently reaches the surface, although it does not spread out thereon, and when that condition is reached liquefaction commences and extends down through the heart of the growth or along the old original line of puncture. This is seen to be full of fine granules as above, only some have settled at the bottom of the liquefaction, making a slight precipitate. Thirty-six days after inoculation all the gelatine involved in the colony has become liquid, forming a funnel-shaped liquefaction in which fine particles are suspended, and some slight collection of these at the bottom of the funnel. Rest of the gelatine remains clear. Gradually the whole tube becomes involved, and at the end of 40 days all the gelatine is liquefied. It is cloudy with fine granules, and a precipitate of same nature.

Bouillon.—Grows at first as a simple haziness throughout the medium, but later a strong, tenacious whitish growth occurs on the surface, which is broken up by much shaking, and partially sinks.

Potato.—After four days whitish, thin, flat growth, inclined to a slight tinge of pink. Surface smooth but dry, and not glistening. Grows slowly. After two weeks it has gradually become brownish and apparently granular, but which, on close examination, shows it to be very finely wrinkled. Potato substance turns dark brown. Edges of colony are smooth and glistening, and the whole surface glistening.

Temperature.—Grows at ordinary temperature.

Spore formation.—Some spores seen, being generally two to each bacillus, round, clear and oval, and not placed in any particular part of Bacillus.

Color.—White growth except on potato, where it becomes brownish after some time.

Gelatine.—Exceedingly slow liquefier, and growth is also very slow.

It therefore remains to be proved by inoculation experiments into the trees, and contamination of the flowers and of the soil, which one of the three forms is the cause of yellows, or if each one will produce a diseased condition of the trees so experimented with, and I hope at some future date to be able to lay before the Canadian Institute the results of such investigations.

Granted that the disease be due to a specific organism, then it behooves this Institute to instigate a movement for a government power to be granted to properly qualified persons to adopt means for the destruction of affected trees, and the isolation in some manner of the diseased orchards. And if laws stringent enough be passed, it is in my opinion possible to stop the spread of a disease, which, if not soon controlled, will remove from the Niagara peninsula a most profitable industry.

Again, the appointments of inspectors should be so managed that competent men should receive them and persons who will not have too much to inspect, and hence imperfectly perform their duties, and also the remuneration should be sufficient to make it worth their while to accept a post with which more or less disagreeableness is necessarily associated.

I think to all thinking men the necessity will appear for the adoption of some such measures ; for no more right has a man to keep standing in his orchard a diseased tree which is apt to contaminate and destroy his neighbor's trees, than he would be justified in allowing infectiously diseased animals the liberty to roam the roads and fields.

Treatment.—Many things have been tried for the allaying of the disease, but as yet no chemical substance has been found to cause an alleviation of the affection.

To prevent its spread, the immediate destruction of the trees is the first thing necessary, and now that we have the disease so much with us, care in the cleaning and disinfecting of the pruning knives after each tree has been attended to, would perhaps further stop the disease, as the tree may be affected before being apparent to the eye. For such purposes I should recommend two sets of knives, and while working on one tree with one set, let the other be lying in 1 in 40 solution of carbolic acid, which any druggist can make up.

As to whether any remedy can be found for the diseased trees, it cannot be replied to yet, and with the great and grand advancements which bacteriology has made of late in the treatment of disease, both in man and animal, I would not be justified in hazarding any opinion, but do hope that some method may yet be discovered, which will save the trees, although at present I am very dubious. That we can do much in stopping the progress of the disease by the total destruction of the diseased trees cannot be doubted, and let us hope that other results may follow.

Lastly, I am sure that Dr. A. B. Macallum unites with me (as he went with me on each excursion to Niagara) in expressing sincerest thanks to the gentlemen who entertained us so very kindly, placed their trees and orchards at our disposal, and were so kind in coming forward and helping us in every way possible. I myself thank Dr. Macallum for his most valuable assistance on each occasion, and it was through his suggestions that the above work was undertaken.

essarily

adop-
stand-
ate and
llowing
elds.

of the
use an

s is the
with us,
er each
, as the
ch pur-
on one
carbolic

, it can-
which
in man
but do
e trees,
uch in
the dis-
ts may

(as he
incerest
placed
ing for-
r. Mac-
it was